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# NEW SPECIES OF COLLEMBOLA (ENTOGNATHA) FROM ISRAEL

**I. Ja. Kaprus'** [1], **E. Nevo** [2]

[1] *State Museum of Natural History of NASU, Teatral'na str., 18, L'viv, 79008 Ukraine*
*E-mail: museum@lviv.net*

[2] *Institute of Evolution, University of Haifa, Haifa, 31095 Israel*

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**New Species of Collembola (Entognatha) from Israel. Kaprus' I. Ja., Nevo E.** — As a result of a taxonomic study of the springtails of Mount Carmel (northern Israel), *Willemia tali* Kaprus' et Nevo, sp. n. and *Minotaurella edaphica* Kaprus' et Nevo, sp. n. are described. Morphological characteristics of the rare species *Folsomides marchicus* (Frenzel, 1941), very similar to European material, are also provided.

Key words: Collembola, *Willemia, Minotaurella, Folsomides*, new species, Israel.

**Новые виды Collembola (Entognatha) из Израиля. Капрусь И. Я., Нево Э.** — В результате таксономических исследований ногохвосток горы Кармель на севере Израиля, описаны *Willemia tali* Kaprus' et Nevo, sp. n. и *Minotaurella edaphica* Kaprus' et Nevo, sp. n. Приведена также морфологическая характеристика редкого вида *Folsomides marchicus* (Frenzel, 1941), который близок к европейскому материалу.

Ключевые слова: Collembola, *Willemia, Minotaurella, Folsomides*, новые виды, Израиль.

### Introduction

Studies of Collembola in Israel were carried out for nearly 100 years. During the last decade this work has been intensified especially in the Mount Carmel (lower Nahal Oren). Recently, more than 60 species of springtails were recorded, of them 10 new species and subspecies have been described. Detailed information on the history of Collembola studies in Israel can be found in a series of special works (Gruia, 1995; Gruia at ai, 1999, 2000).

As a result of our studies in 1999–2000 in the "Evolution Canyon" (Mount Carmel), 55 species of springtails have been recorded; four of them are new (two species are described below).

### Material and methods

The description of natural conditions of the observed area was considered by E. Nevo (1995).

The soil samples (litter and upper layer of soil 5 cm deep) were taken by metal auger and extracted for five days in a modified Tulgren's apparatus. Material was fixed in 80% ethanol. The springtails were then placed into Fore's solution and identified. Nomenclature of *Willemia* antennal sensilla chaetotaxy follows J. I. Arbea and R. Jordana (1986).

The holotypes and paratypes of the new species are deposited in the collection of the State Museum of Natural History of NASU, L'viv, Ukraine (SMNH).

## Taxonomic descriptions

### ***Willemia tali*** Kaprus' et Nevo, **sp. n.** (fig. 1)

Material. Holotype ♀, 0.65 mm, Israel, Mount Carmel, lower Nahal Oren, N slope, under *Quercus caliprinos* tree, soil, 16.02.1999 (Pavlicek). Paratypes: 3 ♀, ♂, 0.51–0.60 mm, Mount Carmel, lower Nahal Oren, N slope, under *Olea europaea* tree, soil, 16.02.1999 (Pavlicek) (SMNH).

Diagnosis. Abdominal segment IV without m-row setae; sensillum p4 thin and long. Thoracal segments II and III with complete set of setae (a4 setae present). Ab-

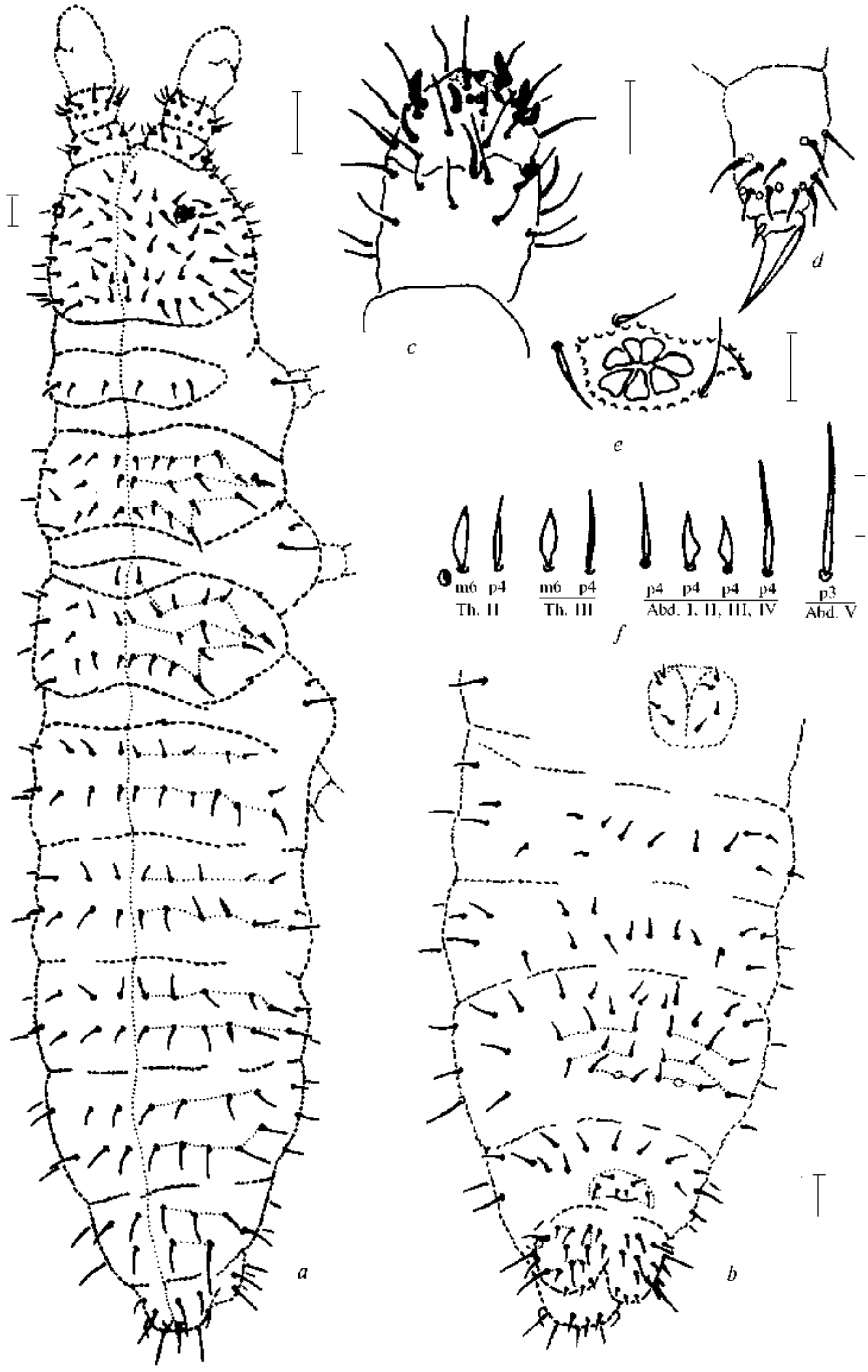



Fig. 1. *Willemia talae*: *a* — dorsal chaetotaxy of body; *b* — ventral chaetotaxy of abdominal segments; *c* — apical part of antenna; *d* — distal part of leg III; *e* — postantennal organ; *f* — sensilla of body. Scale bar for *a, b* — 16 mkm, for *c–f* — 1 mkm.

Рис. 1. *Willemia talae*: *a* — дорсальная хетотаксия тела; *b* — вентральная хетотаксия абдоминальных сегментов; *c* — апикальная часть антенны; *d* — дистальная часть третьей ноги; *e* — постантеннальный орган; *f* — сенсиллы тела. Масштабная линейка для *a, b* — 16 мкм, для *c–f* — 1 мкм.

dominal tergites I, II, III with a2 setae and without m3 and m5. Setae p2 on Abd V absent. Antennal segment IV with four flamelike sensilla (e1, e2, e3, i2); sensillum d is thickened and short.

Description. Body length 0.51–0.65 mm. Tegumental granulation is fine and uniform. Antennal segment IV with four flamelike sensilla (e1, e2, e3, i2) (fig. 1, *c*). Sensillum d is thickened and short, sensillum i1 more slender than others. Lateral sensilla of antenna III organ are about as long as the nearest ordinary setae and placed in a rather great distance one from another (fig. 1, *c*). Antennal segments I, II with 7 and 12 setae respectively. Circular postantennal organ with 6–8 lobes (fig. 1, *e*). Labrum with 4/4,5, 4 setae.

Dorsal chaetotaxy as in figure 1, *a*. Seta a0 and c1 present on the head. Thoracic segments II, III have complete set of setae: 6 a-setae (a4 present), 4 m-setae and 6 p-setae. Tergite of th. II with lateral microsensilla and lanceolate sensillum m6. Sensory seta m6 on the thoracic tergum III is lanceolate too. Sensilla p4 on the thoracic tergites II, III are thin and short. Shape of thoracal and abdominal sensilla as in figure 1, *f*. Abdominal tergites I, II, III with a2 setae and without m3 and m5. The m-row setae on abdomen IV absent; row a with a1, a2, a4, a5 setae and row p with p1, p2, p3, p4, p5; sensillum p4 is thin and long. Abdominal tergite V without seta p2 and with a2 seta.

Ventral chaetotaxy as in figure 1, *b*. Generally, in the central part of abdominal sternite IV there are 13+13 setae. Each of anal lobes with 17 setae, including setae z and 3 hr. Seta e absent. Ventral tube with 4+4 setae.

Claw without teeth (fig. 1, *d*). Empodial appendage is of about 0.29 the length of the inner adge of the claw. Tibiotarsi I, II, III with 17, 17, 16 setae. Anal spines very small, as long as 0.30 of the claw. Males present.

Affinities. *Willemia tali* sp. n. belongs to the "*anophthalma*" group and fits near *Willemia virae* Kaprus, 1997, described from a cave in Ukraine. These species share the following characters: absence of m-row setae on abdominal tergites IV, m3 and m5 setae on abdominal segments I, II, III and p2 seta on abd. V, same chaetotaxy of the head. The new species is readily separated from it by presence of a4 seta on thoracal segments, the shape of sensilla of body and sensillum d on antennal segment IV, reduce ventral chaetotaxy of abd. IV and anal valves.

Etymology. The new species is named in memory of Professor Nevo's son, Tal.

***Minotaurella edaphica*** Kaprus' et Nevo, **sp. n.** (fig. 2)

Material. Holotype ♀, 0.48 mm. Israel, Mount Carmel, Lower Nahal Oren, N slope, under *Quercus caliprinos* tree, soil, 16.02.1999 (Pavlicek). Paratypes: 2 ♀, ♂, 0.37–0.45 mm, same data as in the holotype (SMNH).

Diagnosis. Body very small. Postantennal organ with 11–12 vesicles. Tibiotarsi I, II, III, with 12, 12, 11 setae, respectively. On th. II sensillum m6 and the abd. III, IV, sensilla p5 thickened. Shape of sensilla as in figure 21.

Description. Body length 0.37–0.48 mm. Colour greyish-blue. Whole body coarsely granulated, raised fields dorsally present (fig. 2, *a*).

Antennal segment IV with 6 thick curved sensilla with distinct heel; sensilla e3 is longer than others; dorsoexternal microsensillum and truncated subapical organite present (fig. 2, *b*, *c*). Sensory organ of antennal segment III consisting of two small globular internal sensilla and two long subcylindrical guard sensilla (ventral sensillum S-shaped); ventral microsensillum present (fig. 2, *b*, *c*). Antennal segment I with 6 setae, antennal segment II with 11 setae.

Postantennal organ elliptical with 11–12 vesicles (fig. 2, *e*). Eyes absent. Maxilla with strongtoothed capitulum and two serrated lamellae (fig. 2, *d*). Mandibula with 4–5 teeth. Labrum with 12 setae (5–3–4). Labium with seta L on low papilla (fig. 2, *f*).

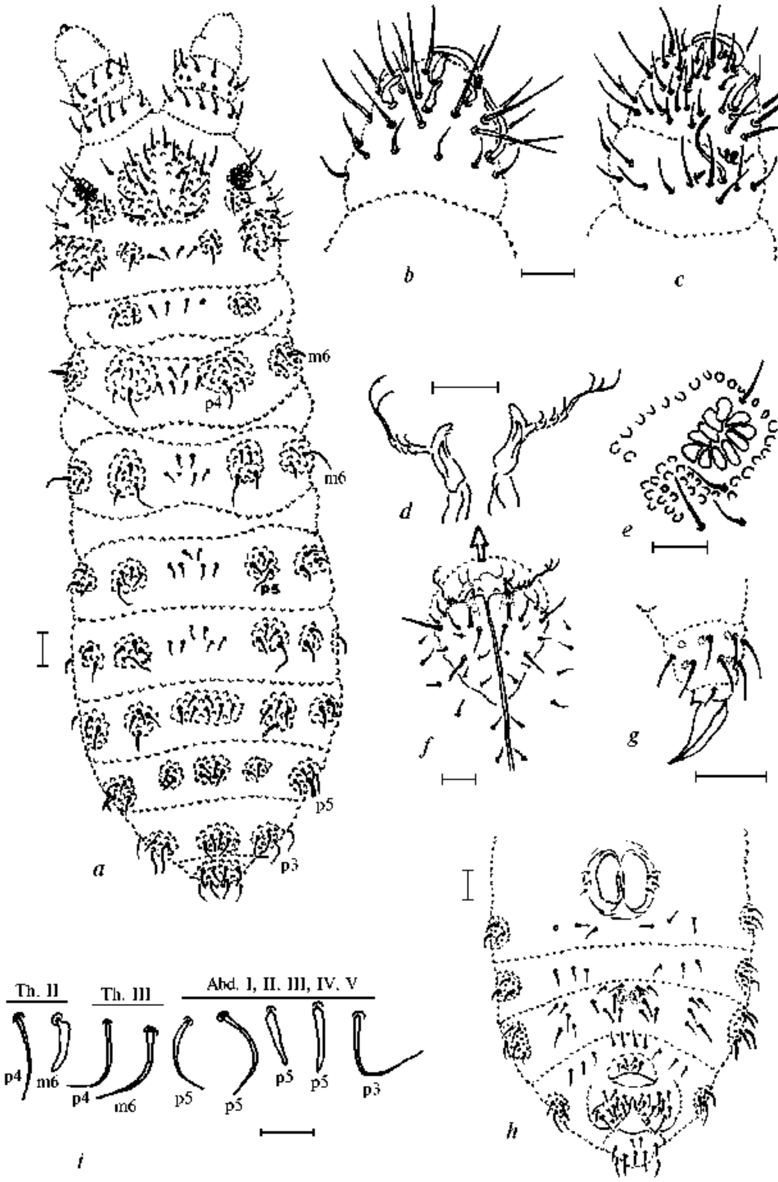



Fig. 2. *Minotaurella edaphica*: *a* — dorsal chaetotaxy of body; *b* — dorsal view of antennae segments III and IV; *c* — ventral view of antennal segments III and IV; *d* — maxilla; *e* — postantennal organ; *f* — labium; *g* — distal part of leg I; *h* — ventral chaetotaxy of abdominal segments; *i* — sensilla of body. Scale bar for *a, h* — 20 mkm, for *b–g, i* — 1 mkm.

Рис. 2. *Minotaurella edaphica*: *a* — дорсальная хетотаксия тела; *b* — вид III и IV антеннальных сегментов с дорсальной стороны; *c* — вид III и IV антеннальных сегментов с вентральной стороны; *d* — максилла; *e* — постантеннальный орган; *f* — нижняя губа; *g* — дистальная часть первой ноги; *h* — вентральная хетотаксия абдоминальных сегментов; *i* — сенсиллы тела. Масштабная линейка для *a, h* — 20 мкм, для *b–g, i* — 1 мкм.

Dorsal chaetotaxy as in figure 2, *a*, with very short ordinary setae. Sensory setae are two types: long and thin or short and thickened (fig. 2, *i*). Head with seta d0.

Thoracic sterna without setae. Ventral chaetotaxy of abdomen as in figure 2, *h*. Ventral tube with 4 + 4 setae. Retinaculum absent. Vestigial furca reduced to two very low tubercles, slightly marked, with 2—3 microchaetae each. Each even anal valve with 12 setae, including setae z and $2^{hr}$.

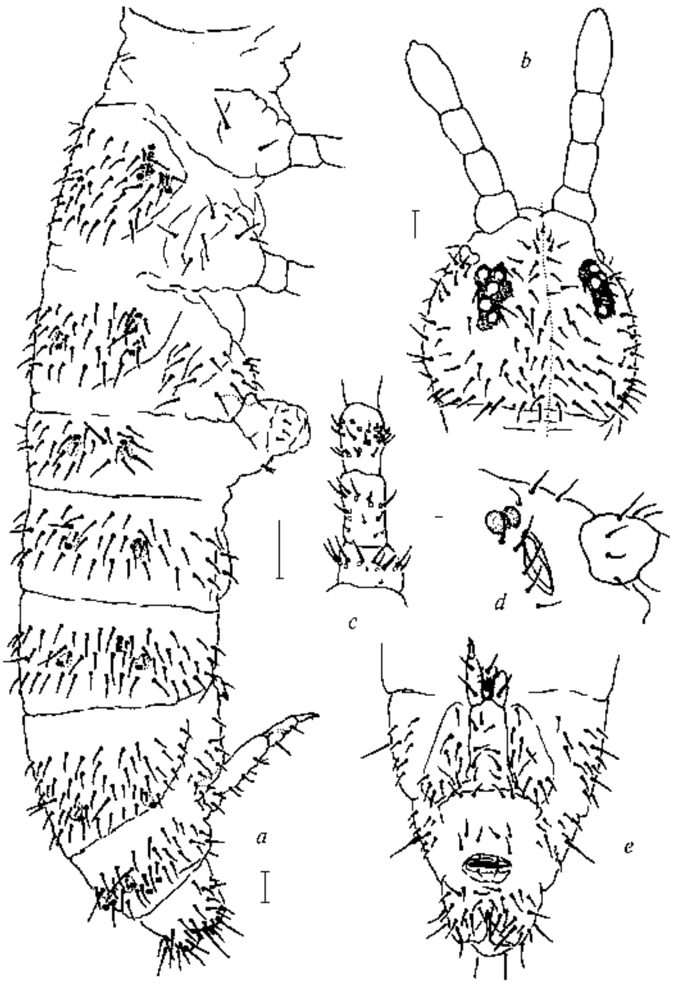



Fig 3. *Folsomides marchicus*: *a* — thoracic and abdominal chaetotaxy (s — sensillum, ms — microsensillum); *b* — dorsal head chaetotaxy; *c* — chaetotaxy of antennal segments I, II, III; *d* — antennal segment I with postantennal organ and nearest ocelli; *e* — ventral view of abdomenal segments IV, V, VI with furca. Scale bar for *a, b, e* — 20 mkm, for *c, d* — 10 mkm.

Рис. 3. *Folsomides marchicus*: *a* — хетотаксия груди и брюшка (s — сенсилла, ms — микросенсилла); *b* — хетотаксия головы; *c* — хетотаксия I, II и III антеннальных сегментов; *d* — I антеннальный сегмент с постантеннальным органом и ближайшими глазками; *e* — вид IV, V, VI абдоминальных сегментов и прыгательной вилки с вентральной стороны. Масштабная линейка для *a, b, e* — 20 мкм, для *c, d* — 10 мкм.

Tibiotarsi I, II, III with 12, 12, 11 setae respectively. Clow without inner tooth, empodial appendage is very small (fig. 2, *g*).

Affinities. W. Weiner (1999), described very small *Neanuridae* found in soil overgrown with grasses between fig trees in Crete as a new genus *Minotaurella* with type species *M. isabellae*. This genus has a mixture of characteristics from *Anurida, Lanzhotia, Micranurida* and *Rusekella*. One more species *M. banyulensis* (Denis, 1947), which was described from southern France earlier has been included to *Minotaurella* as well.

The new species differs from *M. isabellae* in smaller body size, number of vesicles in the postantennal organ (13—15 in *M. isabelle* and 11—12 in the new species), shape of sensory setae on the abdominal segments, number of setae on the tibiotarsi I, II, III (13, 13, 12 in *M. isabellae* and 12, 12, 11 in the new species) and anal lobes (14 in *M. isabellae* and 12 in the new species). The new species differs from *M. banyulensis* by the shape

of the postantennal organ and internal sensilla in sensory organ of antennal segment III, number of vesicles in the PAO and number of sensilla on antennal segment IV, presence of thickened sensory setae on the thoracal and abdominal segments,

Etymology. The name of the new species originated from the Greek "edaphon" (soil).

***Folsomides marchicus*** (Frenzel, 1941) (fig. 3)

Material. 2 ♀, Israel, Mount Carmel, Lower Nahal Oren, S slope, open area with perennials, 29.11.1999 (Pavlicek) (SMNH).

Description. Body length 0.70–0.84 mm. Color with diffuse greyish pigment. Head with 5+5 ocelli. Eye spots darker. Postantennal organ narrow and elongated, 3.50 as long as ocellus (fig. 3, *d*), usually with 3 posterior setae. Maxillary palpus bifurcate. Dorsal chaetotaxy as in figure 3, *a*, *b*. Microsensilla 10/001 (fig. 3, *a*). Macrosensilla long and slender. Lower pair of macrosensilla on Abd. V distinctly thicker than upper pair. SA (subaxial) macrochaetae on Abd. IV about 0.26 as long as tergite, on Abd. V — 0.50 as long.

Tibiotarsi I, II, III with 20, 20, 22 setae. Retinaculum 3/1. Furca strong, dens with 2 posterior setae, without anterior one (2/0). Mucro lookes separated from dens.

Chaetotaxy of antennal segments I, II, III as in figure 3, *c*.

Ventral tube with 4+4 lateral and 2 caudal setae. Empodium about 0.40 as long as claw. Ventral chaetotaxy of abd. IV–VI as in figure 3, *e*.

Remarks. *F. marchicus* was originally described from western Poland, but the type material is lost. A. Fjellberg (1993) prposed new morphological criteria for separation *Folsomides* species, but the status of this species remained obscure. *F. marchicus* needs to be recollected again from its type locality and redescribed.

M. Potapov (2001) has recently redescribed this species from "northern" specimens collected in Germany and western Ukraine, not far from its type locality. The specimens from Mt. Carmel described above are similar to the material from Europe.

*Arbea J. I., Jordana R.* Estudio del genero Willemia en Navarra con especial referencia a la quetotaxia dorsal de la antena (Collembola, Hypogastruridae) // Actas de Las VIII Jordnadas A e E, Sevilla. — 1986. — P. 213–222.

*Fjellberg A.* Revision of European and North African Folsomides Stach with special emphasis on the Canarian fauna (Collembola: Isotomidae) // Entomol. Scand. — 1993. — **23**. — P. 453–473.

*Gruia M.* Collembola from Israel // Soil Fauna of Israel 1 / Eds. V. Decu, E. Nitzu, F. D. Por, Ch. Dimentman. — Bucarest : Romanian Acad. and Israel Acad. Sci. and Human., 1995. — P. 111–128.

*Gruia M., Poliakov D., Broza M.* Collembola of Northern Israel, I // Izrael J. Zool. — 1999. — **45**. — P. 175–198.

*Gruia M., Poliakov D., Broza M.* Collembola of Northern Israel, II // Contr. biol. Lab. Kyoto Univ. — 2000. — **29**. — P. 117–131.

*Nevo E.* Asian, African and European biota meet at "Evolution Canyon" Israel: local tests of global biodiversity and genetic diversity patterns // Proc. R. Soc. Lond., B. — 1995. — **262**. — P. 149–155.

*Potapov M. B.* Synopses on Palearctic Collembola. Vol. 3. Isotomidae // Abh. Ber. Naturkundemus. Gorlitz — 2001. — **73**, N 2. — 603 S.

*Weiner W.* New genus of Pseudachorutinae (Collembola, Neanuridae) // Acta zool. cracov. — 1999. — **42**, N 2. — P. 373–376.